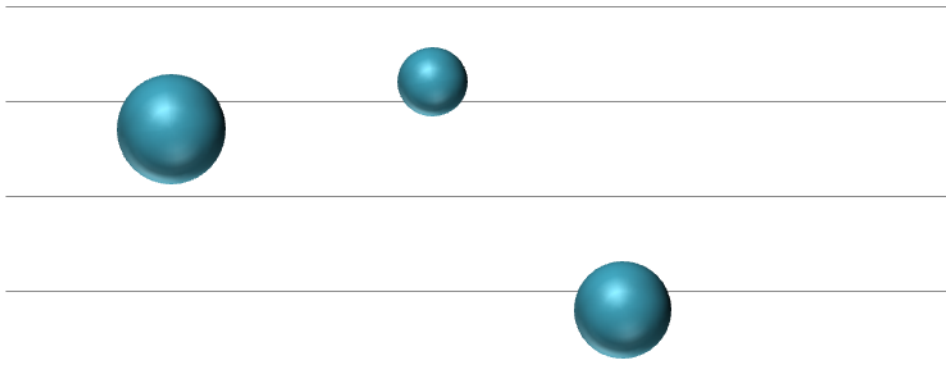


Chapter 6

Risk and Return

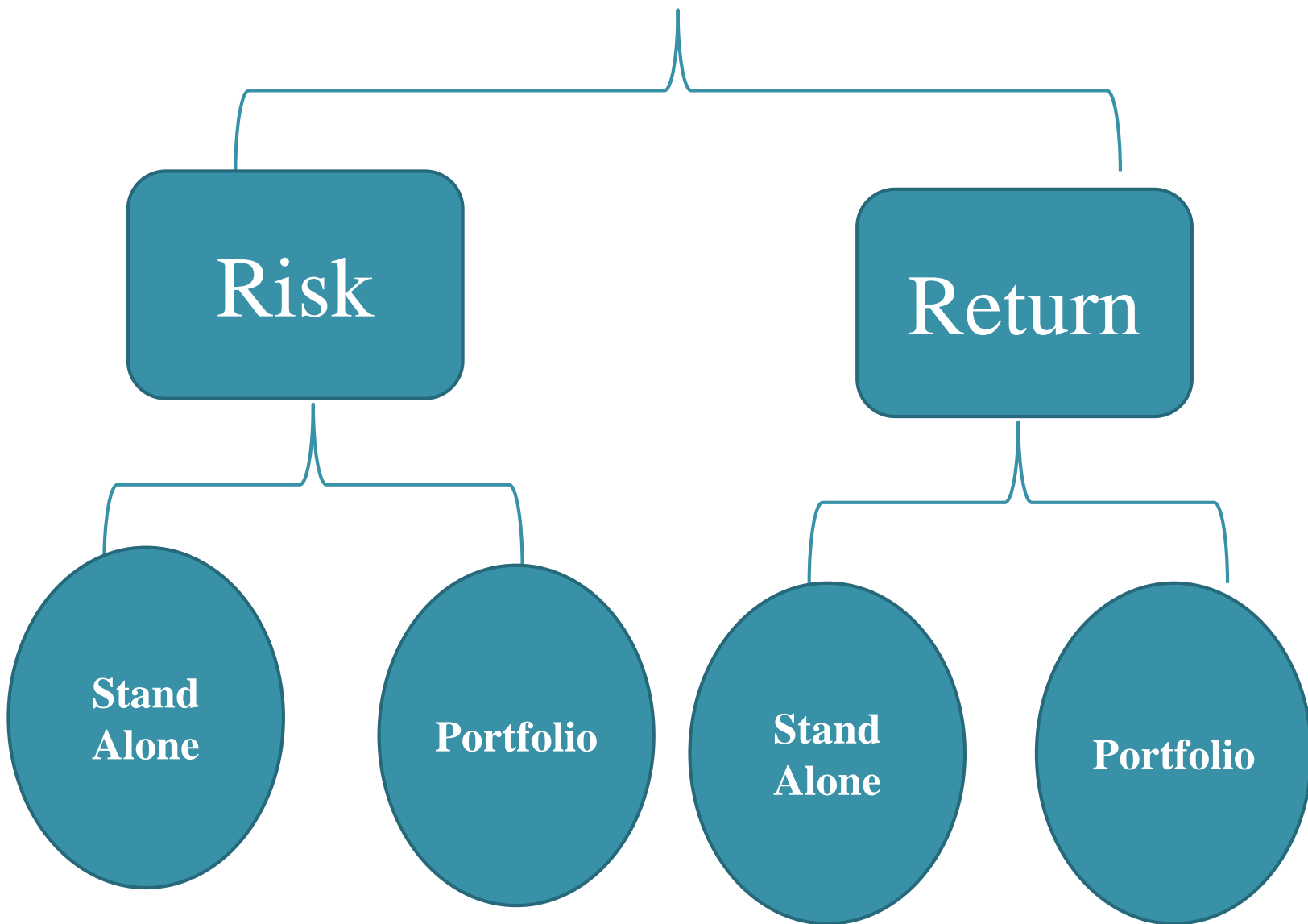
Prepared By : Wael Shams EL-Din





Our Agenda

- Risk & Return Concept
- Calculate Stand Alone Return
- Type of Risks
- Calculate Stand-alone Risk
- Calculate Portfolio Risk & Return



Risk

Risk is defined as the Chance that some unfavorable event will occur. Also can be defined as **Variability** or **Volatility** of return , as $\text{actual Return} \neq \text{Expected Return}$.

Return

Return is the difference between what we sacrifice today and what we will get in the future.

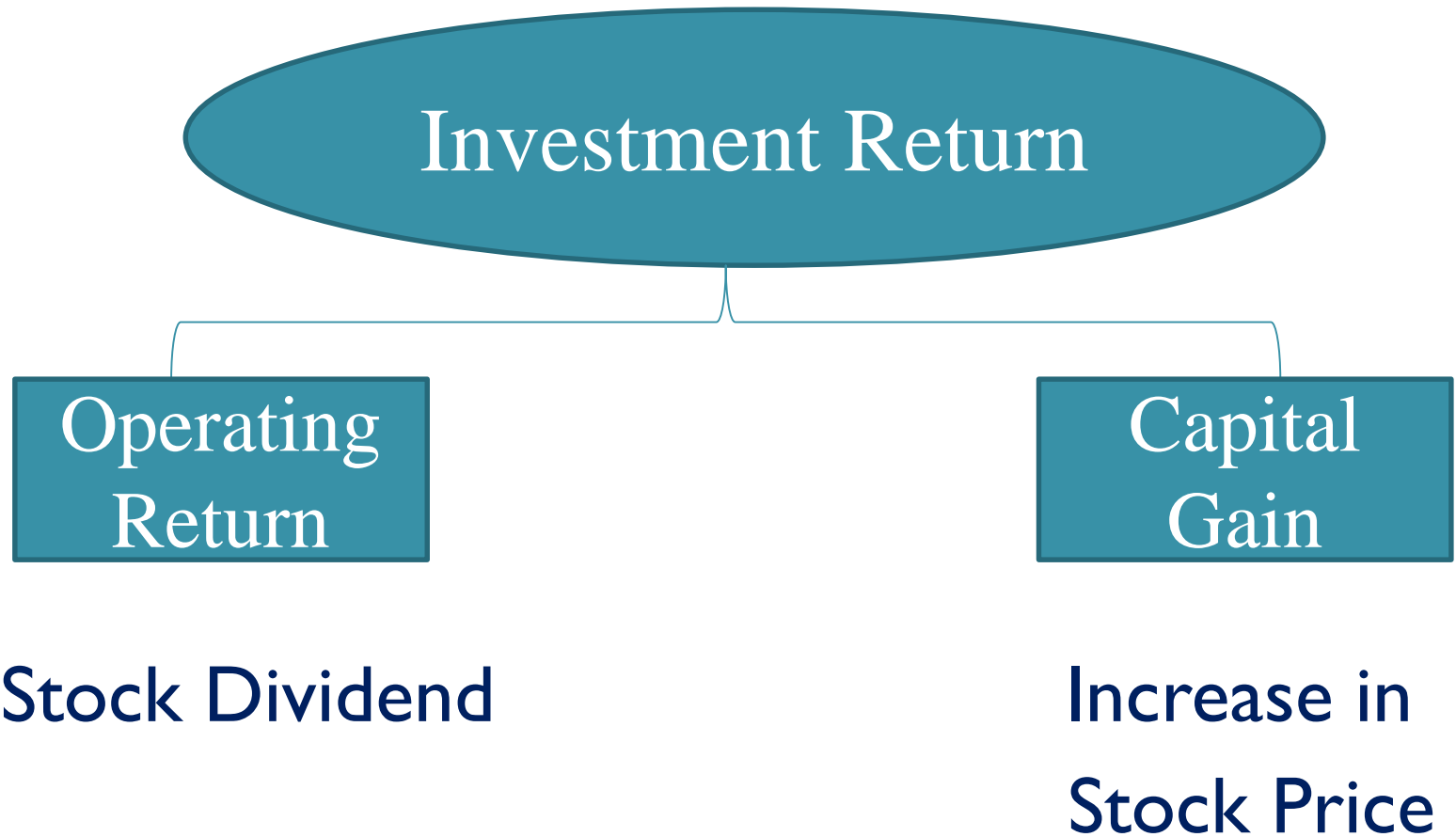


Importance of Risk & Return

Cause all financial decisions are related to the future, so we need to know the expected return as well as risk because expected return will be generated in an environment of **uncertainty**.

Therefore risk and return are considered the two most important concepts in finance and investment.

Investment Return



Example

If we have 1000 Shares of IBM Purchased at price \$20 each. The ending price equal to \$21 and dividends were \$ 2 Per Share.

Answer

Total return = Operating + Capital Gain

Total return (in dollars) = $1000 \times 2 + 1000(21 - 20)$

Total Return = $2000 + 1000 = \$3000$

Return (%) = $\frac{3000}{1000 \times 20} \times 100 = 15\%$



Type of Risk or source of Risk

We have various type of risk such as;

- Credit risk
- Country risk
- Liquidity Risk
- Interest rate Risk
- Market Risk
- Exchange rate Risk
- Operation Risk

Credit Risk

- Credit risk known as *default* risk which mean that company fail to meet its obligations to service debt.
- The higher the Credit risk, the higher the required rate of interest for lending.
- Credit risk is a vital component of fixed-income investing (Bonds) that is why ratings agencies such as *S&P*, *Moody's* and *Fitch* evaluate the credit risks of thousands of corporate issuers and municipalities on an ongoing basis.

Country Risk

- Country risk is a collection of risks associated with investing in a country. These risks include *Political risk, exchange rate risk, economic risk, sovereign risk and transfer risk*, which is the risk of capital being locked up or frozen by government action.
- Country risk varies from one country to another. Some countries have high risk which discourage foreign direct investment(FDI).

Liquidity Risk

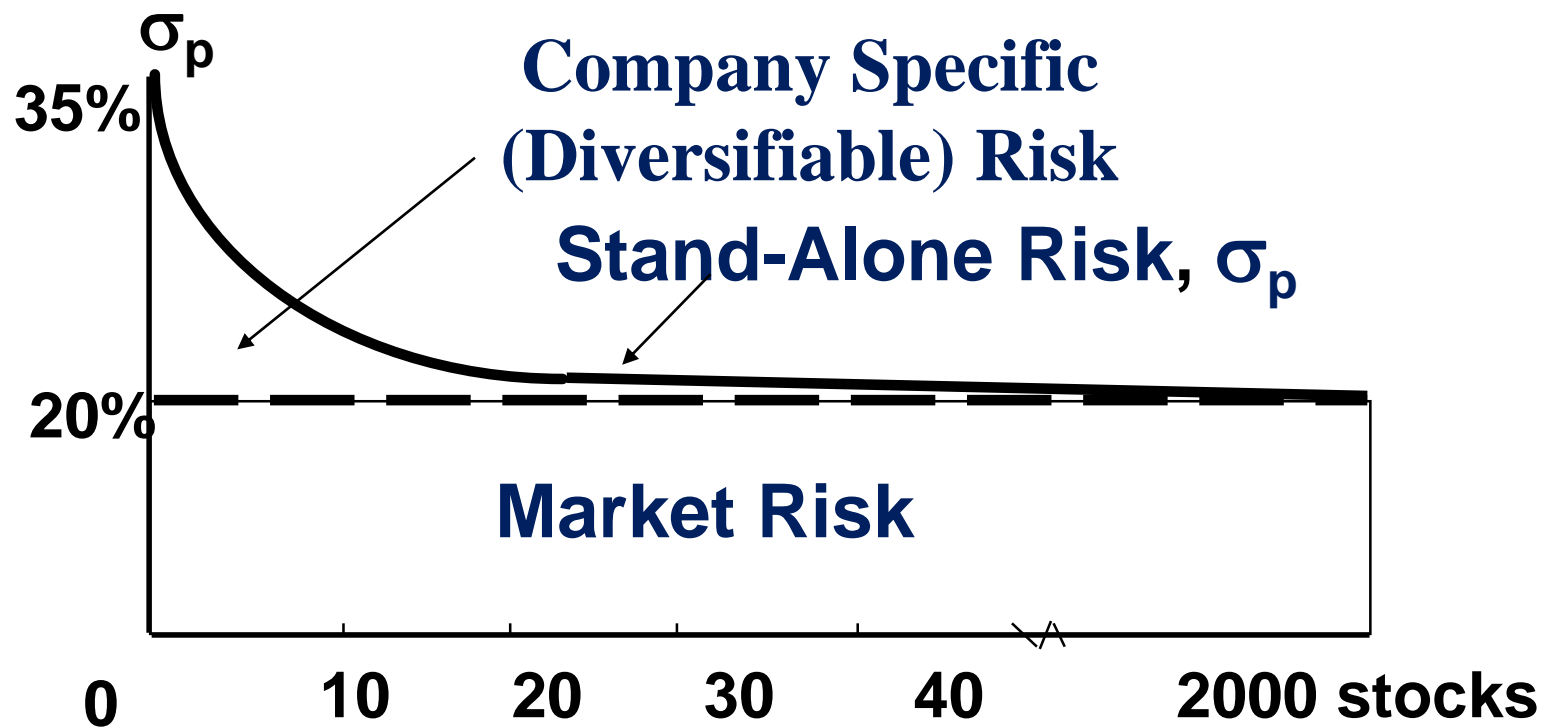
- Liquidity risk refer to multiple dimensions; *Failure to raise Funds at normal cost, Market Liquidity Risk and Asset Liquidity Risk.*
- The cost of funds depend on the company's credit rating. If the credit rating deteriorate cost of fund becomes more costly which will negatively impact the profitability of the Company.

Interest Rate Risk

- The interest rate risk is the risk occur due to the movements of interest rates. Anyone who borrow is subject to interest rate risk.
- The borrower paying a variable rate bear a higher costs when interest rates increase. Such as borrow with (LIBOR + Margin).

Market Risk

- Market risk is the risk of experiencing losses due to unexpected and adverse changes in the market Price factors (such as Equity price and commodity price).

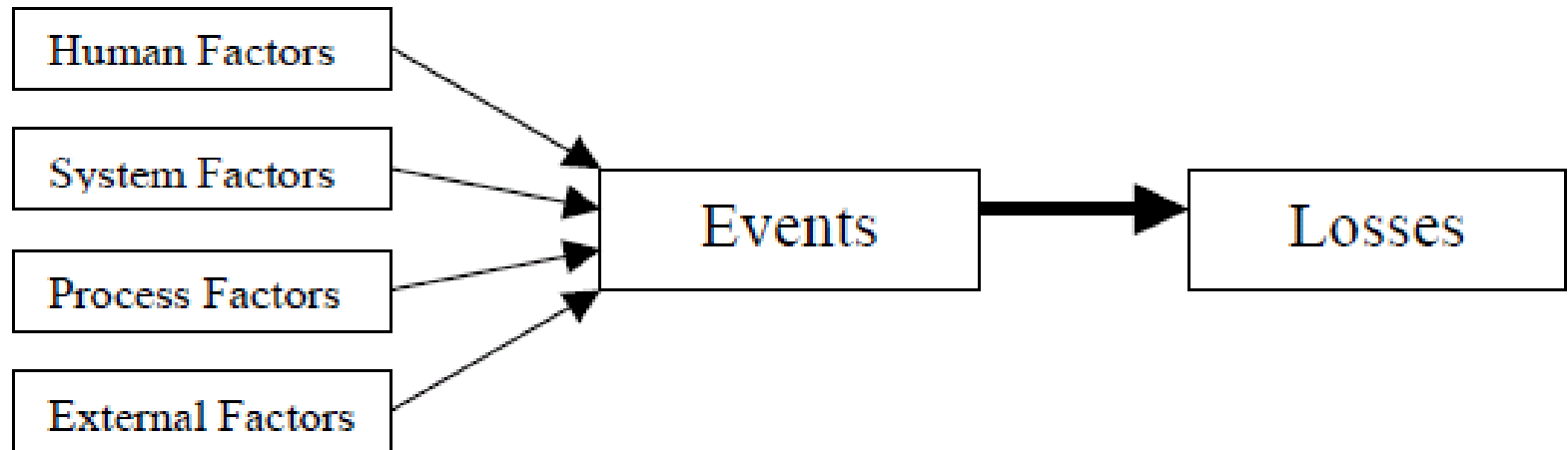


Foreign Exchange Risk

- Foreign exchange risk is the currency risk that might incur losses due to changes in the exchange rates.
- Variations in earnings result from changes in exchange rates will affect the values of assets and liabilities denominated in foreign currencies.
- Foreign exchange risk relates to Asset and liability management (ALM) with Multi currencies. Classical hedging instruments accommodate both interest rate and exchange rate risk.

Operational Risk

The Risk of direct or indirect loss resulting from failed in *People , System, Processes and External Events*.



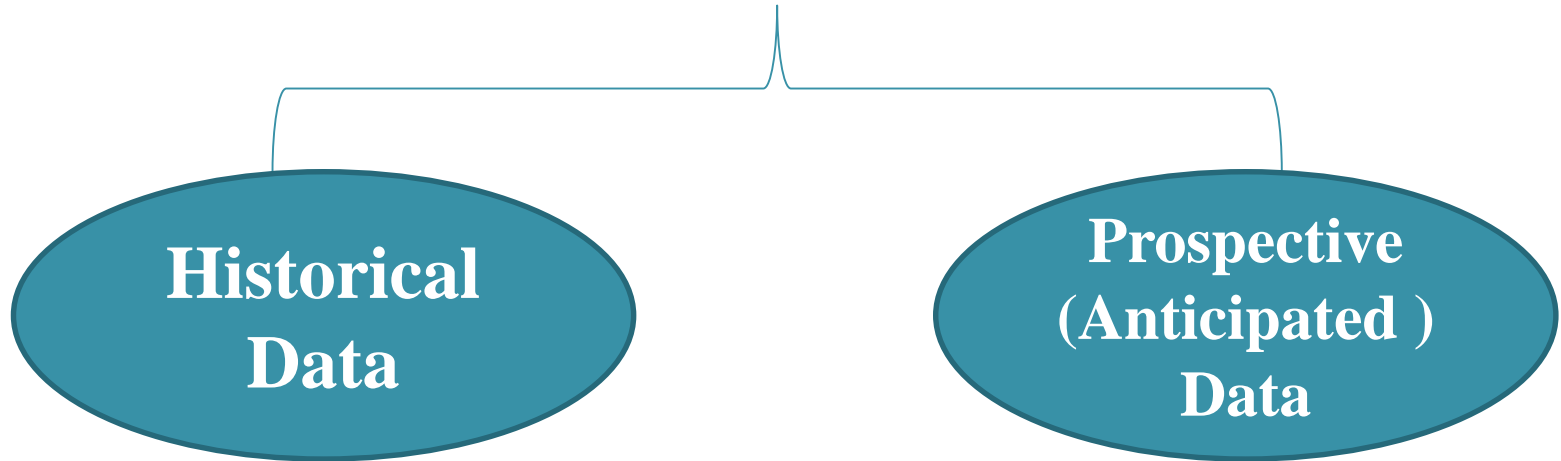
Factors

Causing events

**Resulting
in Losses**

How to Calculate Risk?

Stand alone Risk



Calculating Risk Based on Historical data (for one Stock)

Year	Return
1	10%
2	9%
3	11%

Year	R	$(R-\bar{R})$	$(R-\bar{R})^2$
1	10	0	0
2	9	-1	1
3	11	1	1
Total	30	Zero	2

Answer

$$(\bar{R})_{\text{Mean}} = \frac{30}{3} = 10$$

$$\sigma^2 = \frac{(R - \bar{R})^2}{N-1} = \frac{2}{3-1} = \frac{2}{2} = 1$$

$$(\text{Standard Deviation}) \quad \sigma = \sqrt{1} = 1$$

Calculating Risk Based on Perspective or Probability (for Stock X)

Economic Status	Probability	Return
Very Bad	0.10	(-) 22%
Bad	0.20	(-) 2%
Fair	0.40	20%
Good	0.20	35%
Very Good	0.10	50%
Total	1	

Answer

	P	R	P X R	R- \bar{R}	(R- \bar{R}) ²	(R- \bar{R}) ² X P
V. Bad	0.10	-0.22	-0.022	-0.394	0.1552	0.0155
Bad	0.20	-0.02	-0.004	-0.194	0.0376	0.0075
Fair	0.40	0.20	0.08	0.026	0.0007	0.00028
Good	0.20	0.35	0.07	0.176	0.0310	0.0062
V. Good	0.10	0.50	0.05	0.326	0.1063	0.0106
Total			0.174			0.0400



\bar{R}

Answer

Expected Rate Of Return(X)

$$= 0.174 = 17.40\%$$

$$\text{Variance } \sigma^2 = 0.0400$$

$$\text{SD } (\sigma) = \sqrt{0.0400} = 0.20$$

$$\sigma = 20\%$$

Return of Stock (X)	17.40%
Risk of Stock (X)	20%

Calculating Risk (For Stock Y)

Condition	Probability	Return
Bust	0.10	0.28
Below.AVG	0.20	0.147
AVG	0.40	-
Above Avg.	0.20	-0.10
Boom	0.10	-0.20
Total	1	

Calculating Risk (For Stock Y)

Condition	P	R (Y)	R X P	R- \bar{R}	(R- \bar{R}) ²	(R- \bar{R}) ² X P
Bust	0.10	0.28	0.028	0.2626	0.06896	0.006896
Below.AVG	0.20	0.147	0.0294	0.1296	0.016796	0.0033592
AVG	0.40	-	-	-0.0174	0.000303	0.0001212
Above Avg.	0.20	-0.10	-0.02	-0.1174	0.013782	0.0027564
Boom	0.10	-0.20	-0.02	-0.2174	0.04726	0.004726
Total	1		0.0174			0.017859

\bar{R}

Answer

Expected rate of return (Y)

$$(\hat{R}) = 0.0174 \times 100 = 1.74\%$$

$$\sigma^2 = (\text{Variance}) = 0.017859$$

$$\text{SD } (\sigma) = \sqrt{0.017859} = 0.1336 \times 100 = 13.36$$

Return of Stock Y	1.74%
Risk of Stock Y	13.36%

Investment Rules in selecting between different assets (stocks)

Stock	Expected rate of return	Risk σ
X	17.40%	20%
Y	1.74%	13.36

Investment Rules (1)

- If 2 stocks have the same return, we will select the one with Lower Risk.

	A	B
Return (R)	10%	10%
Risk (σ)	2	1

We will select stock B since it has *Lower* Risk.

Investment Rules (2)

- If 2 stocks have the same Risk, we will select the one with **High** Return .

	A	B
Return (R)	10%	15%
Risk (σ)	2	2

We will select stock B since it has **High** Return.

Investment Rules (3)

- If 2 stocks have different return and different risks here we use Co-variance OR coefficient of variation.

	X	Y
Return (R)	17.40%	1.74%
Risk (σ)	20%	13.36%

$$CV = \frac{\text{Risk}}{\text{R}}$$

We will select the stock with *Lower* CV

Answer

$$CV(X) = \frac{20}{17.40} = 1.15 \text{ (✓)}$$

$$CV(Y) = \frac{13.36}{1.74} = 7.68$$

We will select stock (X) who has a **Lower** (CV) because each 1.15 unit of risk generate 1 unit of return.

Sharp Ratio

Sharp Ratio = $\frac{\text{Expected rate of return } (\bar{R})}{\text{Risk } (\sigma)}$

	A	B
Return (\bar{R})	15%	20%
• Risk (σ)	3%	5%

$$\text{Sharp Ratio (A)} = \frac{15}{3} = 5 \quad (\checkmark)$$

$$\text{Sharp Ratio (B)} = \frac{20}{5} = 4$$

We will select the *Higher* one, highest return for each unit of risk.

Risk & Return for Portfolio

Standard deviation measure stand alone risk, but if the decision involve more than one asset which mean that it is a portfolio of assets and this case the risk of this portfolio is affected by :

- Standard deviation of each asset on that portfolio.
- The Relationship Between the moves in the returns of one asset and moves in the return of the other assets which is measured by correlation.

The main objective of the portfolio is to diversify the risk not to increase the return

Correlation Coefficient

- It can vary in the range Between $(+1) \rightarrow (-1)$
 $+1 \rightarrow$ Mean Perfect Positive correlation, move together in the same direction.
 $-1 \rightarrow$ Mean Perfect Negative correlation, move in opposite direction.

This means that when stocks are Perfectly Negative correlated ($\text{Corr.} = -1$), all risk can be diversified away.

but when stocks are Perfectly Positive correlated ($\text{Corr.} = +1$) diversification doesn't work whatsoever. In real life most stocks are Positively correlated but Not Perfectly .

Expected Return of 2-Stock Portfolio

Stock	Expected rate of Return	Weight	Weighted Avg. Return
X	17.40%	50%	8.70%
Y	1.74%	50%	0.87%
Total		100%	9.57%

Risk of the Portfolio

Stock	Risk	Weight	Weighted Avg. Risk
X	20%	50%	10%
Y	13.36%	50%	6.68%
Total		100%	16.68%

As we see from the above mentioned table that weighted average risk is equal 16.68% without taking into consideration the **Correlation** factor which is already exist between the two stocks X & Y which is = **0.35**

Risk of Portfolio Formula

By applying the formula of risk of the portfolio

$$\begin{aligned}\sigma_P &= \sqrt{W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2W_A W_B \sigma_A \sigma_B R_{AB}} \\&= \sqrt{(0.50)^2 \times (0.20)^2 + (0.50)^2 \times (0.1336)^2 + 2(0.50)(0.50)(0.20)(0.1336) \times 0.35} \\&= \sqrt{0.01 + 0.00445 + 0.004676} \\&= \sqrt{0.019126} \\&= 0.1383 = 13.83 \%\end{aligned}$$

Thank You

